15. **(New)** The reactor according to claim 1 , wherein the reactor further comprises in spaces among catalyst beds a nozzle for feeding a quenching oil or a quenching gas for temperature control of the reactor.

16. **(New)** The process according to claim 10, wherein the process further comprises feeding a quenching oil or a quenching gas for temperature control of the reactor into spaces among catalyst beds.

17. **(New)** The process according to claim 10, wherein the first to the last catalyst layers are separately packed into a plurality of reactors, respectively.

18. **(New)** The process according to claim 10, wherein the contact of a heavy oil with hydrogen gas is conducted by a method selected from the group consisting of a cocurrent descending flow method, a cocurrent ascending flow method and a countercurrent method.

REMARKS

The specification has been amended to identify a prior related

application and to correct minor informalities.

Claims 1 and 10 have been amended to correspond to claims 1 and 10 as amended in the paper filed December 20, 1999, and in the paper filed September 21, 2000, in the parent application, Serial No. 09/139,773. Claims 1 and 10 have also been amended to clarify that the catalyst layers, rather than the catalyst particles, satisfy the relationship represented by the formulae in those claims.

New claims 15-18 have been added to the application. New claims 15 and 16 correspond to claims 15 and 16 added to the parent application in the paper filed December 20, 1999. New claim 17 is supported by the description on page 9, lines 3 to 6, of the present specification. New claim 18 is supported by the description on page 8, lines 18 to 21, of the present specification.

Claims 1-16 in the parent application were finally rejected under 35 U.S.C. § 103(a) as being obvious over Angevine, U.S. Patent No. 4,306,964, in view of Frye et al., U.S. Patent No. 3,928,178. In an Advisory Action after Final, the Examiner maintained that the disclosure of a three catalyst system in the Angevine reference both satisfied the relationships of sequential catalyst layers as recited in claims 1-16 and suggested the use of

a fourth catalyst that would also satisfy the claimed relationships.

The applicants assert that the disclosure in Angevine of an example of three catalyst layers that exhibit values that satisfy the claimed relationships does not support the position that the Angevine reference explicitly teaches or suggests anything that would make a person of ordinary skill in the art believe that the three catalysts were selected on account of their satisfying those relationships or that a fourth catalyst would be selected to necessarily also satisfy those relationships.

In the present invention a hydrotreating reactor is characterized as comprising <u>at least four</u> catalyst layers in which the surface area per cubic meter of the catalyst <u>layers</u> necessarily satisfies the relationship where each sequential layer has an equal or greater surface area than the previous layer (formula 1) and the relationship where each <u>layer</u> necessarily has a pore volume per cubic meter that is equal to or greater than 115% of the previous layer's pore volume (formula 2).

The Angevine reference includes three catalyst layers which exhibit pore volume and surface area relationships that <u>happen</u> to satisfy the limitations of formulae 1 and 2 of the claims of the present application. For example, Angevine discloses a catalyst

layer C that has a larger surface area relative to a catalyst layer B, and that catalyst layer B has a larger surface area than a catalyst layer A (see Table I). The pore volumes of the catalyst layers A, B and C, calculated from the product of the particle density values and the pore volume values for each particle, also satisfy the relationship of the catalyst layer pore volume limitation of formula 2.

However, the reference does not teach or suggest that any three catalysts that it discloses were chosen based on having surface areas or bulk densities that produce such a relationship between the different catalyst layers. A person of ordinary skill in the art would not have been motivated to select a bulk density for each of the beds of catalyst so as to satisfy the surface area or pore volume requirement of the catalyst layers of the present invention. Yet, the bulk density relationship, as it relates to the surface area and pore volume of the catalyst layers is material to obtaining the surface area and pore volume limitations of the present invention.

Therefore, even though catalyst layers A, B and C in the reference happen to satisfy the relationships of formulae 1 and 2, an art-skilled person would not have found it obvious to choosing another catalyst based on the Angevine disclosure that would

necessarily have also satisfied those relationships.

Further, the Angevine reference may include three catalyst layers which exhibit pore volumes that satisfy the relationships of formulae 1 and 2 in the claims of the present application, however, nothing disclosed in Angevine suggests that a chosen fourth layer would necessarily also satisfy the formulae. In fact, none of catalyst layers D, E or F, if chosen as the fourth catalyst layer, satisfy formula 1. The surface area values for each of those layers would be less than the surface area for catalyst layer C. The Angevine reference also teaches away from even selecting a fourth layer as its preferred embodiment uses just three layers (see column 5, lines 19-33).

Because the claims of the present application require at least four catalyst layers, a person of ordinary skill in the art would not have found the invention obvious in view of the Angevine reference.

In the absence, therefore, of proper reasoning or evidence that a person of ordinary skill in the art would be motivated to choose or would otherwise necessarily choose bulk densities for the catalysts of the Angevine reference that will provide surface areas and pore volumes per cubic meter of catalyst layer that meet the limitations of the claims of the present application, the Office's

case for prima obviousness based on the disclosure of the Angevine reference must fail.

Frye et al. was cited in the parent application only as teaching the injection of a quench fluid between catalyst beds. Frye et al. fails to overcome the insufficiencies of the Angevine reference.

The packing limitation in claim 17 is not taught or suggested by the combination of the Angevine and Frye et al. references. This claim is directed to the choice of packing the catalyst layers of the invention into a reactor or plurality of reactors. The Angevine reference does not teach how its catalysts are packed into a reactor and does not suggest anything that would lead an art-skilled person to select a plurality of reactors for each layer.

Claim 18 is also not taught or suggested by the combination of the Angevine and Frye et al. references. This claim includes a limitation relating to the flow method by which the contact of a heavy oil with hydrogen gas is conducted.

Applicants respectfully submit that the claims of the application, as amended, are in condition for allowance.

CONTINUATION APPLICATION OF
Serial Number 09/139,773
PRELIMINARY AMENDMENT

PATENT

In the event any additional fees are required, please charge our Deposit Account No. 111833.

Respectfully submitted,

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